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ACCIDENTS AT METALLURGICAL WORKS IN THE UNITED STATES

DURING THE CALENDAR YEAR 1917

COMPILED BY

ALBERT H. FAY



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ACCIDENTS AT METALLURGICAL WORKS IN THE UNITED STATES DURING THE CALENDAR YEAR 1917.

Compiled by ALBERT H. FAY.

INTRODUCTION.

This paper, the fourth report of the Bureau of Mines on accidents at metallurgical works, shows a slight increase in fatal accidents at both smelters and ore-dressing plants, while the nonfatal injuries show a small decrease. The figures cover the returns from smelting plants, including copper, lead, zinc, and quicksilver smelters, as well as refineries. The iron blast furnaces are not included in the figures given herein. The ore-dressing plants represent concentrating plants for copper, lead, and zinc ores, stamp mills, cyanide plants, iron-ore washers, flotation mills, sampling works, etc. The total number of men reported employed in the metallurgical works, both smelters and ore-dressing plants, was 68,487, as compared with 66,194 in 1916, 49,891 in 1915, and 43,007 in 1914.

The number of fatalities reported at metallurgical plants was 116, 47 at ore-dressing plants, 53 at smelters, and 16 at auxiliary works, including shops, yards, etc. The number of nonfatal injuries reported at ore-dressing plants was 2,952, at smelters 7,745, and at auxiliary works 2,881.

The fatality and injury rates based on 300-day workers for 1917, compared with previous years, are given in Table 1.

TABLE 1.—*Summary of labor and accidents at metallurgical plants.*

	Men employed.		Days of labor performed.	Average days active.	Total number killed.	Number killed per 1,000 300-day workers.	Total number injured.	Number injured per 1,000 300-day workers.
	Actual number.	300-day workers.						
Ore-dressing plants:								
1913.....	14,985	16,154	4,846,338	323	16	0.99	1,977	122.38
1914.....	15,128	15,225	4,567,529	302	23	1.51	1,434	94.19
1915.....	18,564	19,107	5,732,184	309	30	1.57	2,095	109.65
1916 ^a	22,365	23,470	7,041,083	315	33	1.41	3,184	135.66
1917 ^a	24,111	24,372	7,311,499	303	47	1.93	2,952	121.12
Smelting plants:^b								
1913.....	20,564	24,309	7,292,766	355	47	1.93	4,247	174.71
1914.....	27,879	32,336	9,700,769	348	33	1.02	5,673	175.44
1915.....	31,327	36,262	10,878,486	347	38	1.05	5,718	157.69
1916.....	43,829	49,363	14,809,046	338	36	.73	9,656	195.61
1917 ^a	44,376	50,659	15,197,643	342	53	1.05	7,745	152.88

^a Not including auxiliary works, as shops, yards, etc.

^b Exclusive of the iron and steel industry.

ACKNOWLEDGMENTS.

The data presented in this paper were voluntarily supplied by the officials and managers of the metallurgical companies at the request of the bureau, there being no law compelling such companies to render reports. The bureau gratefully acknowledges the hearty cooperation of the many officials who have answered its inquiries, and invites suggestions whereby the annual report of accidents at metallurgical plants may be improved so as to best serve the industry. Data for California and Colorado, respectively, were furnished by the Industrial Accident Commission and the State Commissioner of Mines, as indicated in Table 2. For the compilation of the various tables the author is indebted to assistance rendered by W. W. Adams and Miss Lillian Chenoweth.

CAUSES OF ACCIDENTS.

The percentage of accidents due to any one cause is given in Table 7. In the ore-dressing plants machinery was responsible for 29.79 per cent of all fatalities and 15.42 per cent of all injuries. Similar figures for smelting plants are much smaller for the reason that there is more machinery in use in ore-dressing plants than at smelters and the men are usually in closer contact with the machinery, as, for example, at jigs, tables, stamps, rolls, and crushers. There are many revolving shafts, a large number of which have projecting keys, moving belts, wheels, and cams within the reach of the operator. The machinery at smelting plants is usually confined to the power house, where the blowers, engines, and dynamos are placed, and to overhead cranes, almost all of which are entirely out of the reach of the regular smelter employees.

Nineteen per cent of the fatalities at ore-dressing plants were due to falls of persons, whereas at the smelters the fatalities due to falls of persons represented 15 per cent of the total. Fatalities due to electricity represented 16.98 per cent at smelters and 8.51 per cent at ore-dressing plants.

Haulage systems caused 20.76 per cent of the fatalities at smelting plants and 23.40 per cent at ore-dressing plants. Of the nonfatal injuries at ore-dressing plants 5.55 per cent were due to haulage, whereas at smelters 10.41 per cent were due to that cause.

At smelting plants burns from hot metal, slag, etc., claimed 7.54 per cent of the fatalities and 22.33 per cent of the nonfatal injuries.

The tables presented herein call attention to the principal causes of accidents at these works and should serve as guides for the safety engineer to show where it will be possible for him to do his work most efficiently and to accomplish the best results.

The returns tabulated herewith, while representative of the metallurgical industry, are not absolutely complete. They do, however,

cover more than 90 per cent of the industry. The reports received from the operating companies are rendered voluntarily at the request of the bureau, and there are always a few companies that do not reply. Operators of metallurgical plants should be interested enough in accident prevention to contribute whatever aid they can toward reducing accidents in their plants by rendering as complete a report as possible at the close of the year. Hence it is hoped that for the year 1919 those few companies who did not report to the bureau for 1918 will reconsider this matter and furnish a complete report.

CLASSIFICATION OF INJURIES FOR 1916 AND 1917.

Many of the States now have compensation laws, and in order to conform with their classifications the bureau's classification of serious and slight injuries is on a 14-day (2 weeks) basis.

The classification of injuries at mills, smelters, and auxiliary works includes three groups, as follows:

	1917	1916
1. Fatal.....	116	83
2. Serious (time lost, more than 14 days):		
(a) Permanent disability—		
Total.....	5	17
Partial.....	202	200
(b) Others.....	3,302	3,443
3. Slight (time lost, 1 to 14 days, inclusive).....	10,069	11,420
	13,578	15,080
Total.....	13,694	15,163

ACCIDENTS AT ORE-DRESSING PLANTS.

The number killed in the ore-dressing plants in 1917 was 47, or 1.93 per 1,000 300-day workers employed, as compared with 33 in 1916, when the fatality rate was 1.41. The total number of injuries in 1917 was 2,952, as compared with 3,184 in 1916.

Table 2 shows the number of employees by States, the number of days' work performed, together with the number killed and injured. Table 3 shows the fatalities by causes and States, and Table 4 the nonfatal injuries, classified by causes and States, during the calendar year 1917.

Table 5 is a summary of the accidents by causes and by States for the years 1913 to 1917, inclusive.

ACCIDENTS AT SMELTERS.

In 1917 the number of men killed at smelting plants was 53, or 1.05 per 1,000 300-day workers, as compared with 0.73 per 1,000 in 1916. There were reported 7,745 injuries, or 152.88 per 1,000. Table 6 represents a summary of accidents at smelting plants, by

causes and by States, showing the number killed and injured during the calendar years 1913 to 1917, inclusive.

Table 2 shows the number of men employed and the number of days worked at smelters by States for the year 1917. It also shows the total number killed and injured for each State. Tables 3 and 4 show fatalities and injuries by causes and States for 1917.

ACCIDENTS AT AUXILIARY WORKS.

Auxiliary works are intended to include machine shops, carpenter shops, yards, and general construction, all of which, though a part of the metallurgical plants, should not be included in the actual operating departments. The returns for 1917 show 15,555 men employed, with 16 fatalities and 2,881 injuries. Reduced to the 300-day basis, this represents 17,013 300-day workers, with a fatality rate of 0.94 and a nonfatal-injury rate of 169.47 per 1,000. Fifty per cent of the fatalities were due to falls of persons. A large percentage of nonfatal injuries were due to hand tools, falling objects, and falls of persons.

STATISTICAL TABLES.

The tables showing the classification and the number of accidents at metallurgical works in the United States during the calendar year 1917 follow:

TABLE 2.—Number of men employed, number of days worked, and number of men killed and injured at metallurgical plants in the United States, during the year ended Dec. 31, 1917.

State.	Ore-dressing plants.					Smelting plants.					Auxiliary works.					Wid- ows.	Or- phans.
	Men em- ployed.	Days of labor per- formed.	Aver- age days active.	Killed.	In- jured.	Men em- ployed.	Days of labor per- formed.	Aver- age days active.	Killed.	In- jured.	Men em- ployed.	Days of labor per- formed.	Aver- age days active.	Killed.	In- jured.		
Alabama.....	193	44,715	232	1	7						69	10,128	147		5	3	
Alaska.....	467	139,960	300	3	141						232	79,263	342	1	32	15	
Arizona.....	2,630	803,567	306	6	578	4,398	1,520,283	346	10	1,184	1,537	499,665	325	2	471		
Arkansas.....	163	38,343	235		11	530	182,575	344		83	114	30,742	270				
California ..	755	271,800	360		30	590	212,400	360	5	188	100	30,000	300				
Colorado ..	1,715	514,500	300	7	214	2,864	859,200	300	1	331	(c)						
Georgia.....	82	24,769	302		1												
Idaho.....	642	179,238	279		62	(a)					338	114,944	340		17		
Illinois.....	156	43,008	276		9	3,731	1,319,525	354	3	749	1,587	579,060	365	1	316	3	
Kansas.....	206	52,190	156		15	2,148	623,042	290	1	253	19	4,053	217		2	6	
Maryland.....	26	5,432	209			3,414	1,117,802	327	2	359	20	4,053	203		2	1	
Michigan.....	2,426	752,874	310	2	88	1,197	371,479	310		164	(c)					1	
Minnesota.....	1,337	80,703	239		40						22	3,728	169				
Missouri.....	1,523	392,225	258	2	175	1,560	569,400	365	2	437	493	148,563	301	2	108	2	
Montana.....	2,051	605,705	295	6	148	2,399	752,157	314		238	2,930	854,670	292	2	237	3	
Nevada.....	1,565	486,255	311	4	117	1,143	413,423	362	3	132	137	29,022	266		15	7	
New Jersey.....	537	165,308	308	2	57	4,313	1,536,773	356	5	677	1,143	358,252	313		4	7	
New Mexico.....	891	290,846	326	1	183	1,152	22,680	149		10	911	305,591	335	2	177	7	
New York.....	565	156,601	277	1	77	(c)					185	50,956	275		23		
North Carolina.....	46	11,285	245		14						(c)						
Oklahoma.....	452	103,933	230	2	208	5,063	1,827,884	361	4	595	200	69,554	348		44	10	
Oregon.....	97	22,637	244		6	(c)					20	6,965	348		4		
Pennsylvania.....	250	5,165	215		1	3,700	1,332,500	360	3	608	1,291	467,060	362	1	148	3	
South Dakota.....	24	87,475	350		23	(c)					488	176,335	361		264	1	
Tennessee.....	425	114,513	269	1	40		400,962	365		164	(c)	657,387	363	4	531	12	
Texas.....	100	29,330	293	5	496	2,658	952,918	359	9	556	1,811	637,387	363			26	
Utah.....	4,103	1,459,383	356		13	(c)					(c)						
Vermont.....	215	58,308	271		16	(c)					135	38,821	288			2	
Virginia.....	709	206,921	292		8						502	169,500	338		82		
West Virginia.....	63	11,800	187		18						333	100,258	301		44		
Wisconsin.....						1,090	380,578	349	1	182	36	315,514	327	1	163	2	
Wyoming.....	247	64,011	259	3	150	2,213	37,225	329		469	966						
Other States.....	450	107,699	239	1	18	2,213	764,837	346	4								
Total, 1917.....	24,111	7,311,499	303	47	2,952	44,376	15,197,643	342	53	7,745	15,555	5,104,146	328	16	2,881	132	
Total, 1916.....	22,365	7,041,083	315	33	3,184	43,829	14,806,046	338	36	9,656	14,007	4,729,010	338	14	2,240	67	

^a Figures relating to California, in this and all other tables, were supplied by the Industrial Accident Commission of the State of California, San Francisco, Cal.

^b Figures relating to Colorado, in this and all other tables, were supplied by Fred Carroll, Commissioner of Mines, Denver, Colo.

^c Included in "Other States."

TABLE 3.—*Metallurgical plants: Fatalities, by causes and*

State.	Ore-dressing plants. ^a														
	Haulage system (cars, motors, etc.).	Railway cars and locomotives.	Crushers, rolls, or stamps.	Tables, jigs, etc.	Other machinery.	Falls of persons.	Suffocation in ore bins.	Falling objects (rocks, timbers, etc.).	Cyanide or other poisoning.	Scalding (steam or water).	Electricity.	Hand tools, axes, bars, etc.	Nails, splinters, etc.	Flying pieces of rock from sledging or crushing.	Other causes.
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Alabama.....					1										
Alaska.....	1		1			1									
Arizona.....	1				3			1			1				
Arkansas.....															
California.....															
Colorado.....		1	2			2					2				
Georgia.....															
Idaho.....															
Illinois.....															
Kansas.....															
Maryland.....															
Michigan.....	1				1										
Minnesota.....															
Missouri.....				1		1									
Montana.....	2						3				1				
Nevada.....					1			2		1					
New Jersey.....	1				1										
New Mexico.....					1										
New York.....						1									
North Carolina.....								1							
Oklahoma.....						1									
Oregon.....															
Pennsylvania.....															
South Dakota.....															
Tennessee.....															
Texas.....															
Utah.....	1	2					2								
Vermont.....	1														
Virginia.....															
Washington.....															
West Virginia.....															
Wisconsin.....				1	1	1									
Other States.....		1													
Total, 1917.....	7	4	3	2	9	9	3	4	1	4	4	1	1	1	47
Total, 1916.....	3	4			11	2	3	1		2	2	1		4	33

^a Stamp mills, sampling works, slime plants, lixiviation, leaching, cyanide, and flotation mills.

States, during the year ended Dec. 31, 1918.

Smelting plants. ^b															Auxiliary works. ^c														
Haulage system (cars, motors, etc.).															Haulage system (cars, motors, etc.).														
Railway cars and locomotives.															Railway cars and locomotives.														
Cranes.															Railway cars and locomotives.														
Other machinery.															Falls of persons.														
Falls of persons.															Suffocation in ore bins.														
Flying or falling objects (rocks, timbers, etc.).															Flying or falling objects (rocks, timbers, etc.).														
Gas (burns or asphyxiation).															Gas (burns or asphyxiation).														
Scalding (steam or water).															Scalding (steam or water).														
Electricity.															Electricity.														
Hand tools, axes, bars, etc.															Hand tools, axes, bars, etc.														
Nails, splinters, etc.															Nails, splinters, etc.														
Burns from matte, slag, or molten metal (pouring or spilling).															Burns from matte, slag, or molten metal (pouring or spilling).														
Hot-metal explosions.															Hot-metal explosions.														
Other causes.															Other causes.														
Total.															Total.														
Haulage system (cars, motors, etc.).															Haulage system (cars, motors, etc.).														
Railway cars and locomotives.															Railway cars and locomotives.														
Falls of persons.															Falls of persons.														
Falling objects (rocks, timbers, etc.).															Falling objects (rocks, timbers, etc.).														
Nails, splinters, etc.															Nails, splinters, etc.														
Hand tools, axes, bars, etc.															Hand tools, axes, bars, etc.														
Electricity.															Electricity.														
Machinery.															Machinery.														
Failure of ladder, scaffold, or other support.															Failure of ladder, scaffold, or other support.														
Handling hot materials.															Handling hot materials.														
Other causes.															Other causes.														
Total.															Total.														
16	17	18	19	20	21	22	23	24	25	26	27	28	29	30		31	32	33	34	35	36	37	38	39	40	41			
	1			1	3										10			1									1		
	1			2	1										5												2		
				1											1														
															3		1										1		
				1	1										1														
					1										2														
	1	2												1	2			2									2		
		2													3												2		
	1														5			1	1										

^b Blast, reverberatory, and roasting furnaces; converters, casting department, and refineries.

^c Yards, shops, construction, etc.

TABLE 4.—*Metallurgical plants: Injuries, by causes*

State.	Ore-dressing plants. ^a															Total.
	Haulage system (cars, motors, etc.).	Railway cars and locomotives.	Crushers, rolls, or stamps.	Tables, jigs, etc.	Other machinery.	Falls of persons.	Suffocation in ore bins.	Falling objects (rocks, timbers, etc.).	Cyanide or other poisoning.	Scalding (steam or water).	Electricity.	Hand tools, axes, bars, etc.	Nails, splinters, etc.	Flying pieces of rock from sledging or crushing.	Other causes.	
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	
Alabama.....			1		2	1							2		1	7
Alaska.....	1	2	12	2	4	15	2	13	4	1	3	13	22	8	39	141
Arizona.....	34	5	16	7	58	61	2	71	2	1	9	65	31	10	206	578
Arkansas.....			1		2	1									3	11
California.....	1		1	6	11	2			1		1				3	30
Colorado.....	10	3	10	4	27	50		35		1	5	11	11	14	33	214
Georgia.....					1											1
Idaho.....	9		2	4	3	13		3				7	7	3	11	62
Illinois.....	2			3	1	1		1						1	1	9
Kansas.....			1		3	2			1	3				2	3	15
Maryland.....																
Michigan.....	1	2		1	12	15		4		1		12	5		35	88
Minnesota.....	2			1	5	6		6			2	5		3	10	40
Missouri.....	4	2	9	5	13	16		22		2	1	8	11	39	44	175
Montana.....	7	4	14	5	19	17		15	5	3	2	11	10	2	34	148
Nevada.....	4	1	11		15	17		14	2		7	9	6	4	27	117
New Jersey.....	2		1		10	10		9		1	1	3	1		19	57
New Mexico.....	9	2	7	3	28	31		32	8	4	1	20	13	2	23	183
New York.....	5		2	1	9	9		6			2	5	4	3	31	77
North Carolina.....	7											2	2		3	14
Oklahoma.....			2	1	6	11		4				4	1	172	7	208
Oregon.....					2				1			1	1	1		6
Pennsylvania.....					1							1				1
South Dakota.....	3		4		2	3		1					1	1	7	23
Tennessee.....	3				14	4		1		1		2	4	1	10	40
Texas.....			2		2							1			1	6
Utah.....	23	6	11	10	22	85		98			4	42	46	10	139	496
Vermont.....					4							1	1		2	13
Virginia.....			1		1	5		1				7			1	16
Washington.....	2													4	2	8
West Virginia.....																
Wisconsin.....	5	1	6	7	17	12		34			2	12	11	20	23	150
Other States.....	1	1		1	2	1		1				7	1	1	2	18
Total, 1917.....	135	29	112	61	282	399	6	371	24	18	40	249	193	302	731	2,952
Total, 1916.....	146	42	168	82	336	373	4	363	13	35	53	360	171	109	929	3,184

^a Stamp mills, sampling works, slime plants, lixiviation, leaching, cyanide, and flotation mills.

and States, during the year ended Dec. 31, 1918.

Smelting plants. ^b															Auxiliary works. ^c																																								
Haulage system (cars, motors, etc.).		Railway cars and locomotives.		Cranes.		Other machinery.		Falls of persons.		Suffocation in ore bins.		Flying or falling objects (rocks, timbers, etc.).		Gas (burns or asphyxiation).		Scalding (steam or water).		Electricity.		Hand tools, axes, bars, etc.		Nails, splinters, etc.		Burns from matte, slag, or molten metal (pouring or spilling).		Hot-metal explosions.		Other causes.		Total.		Haulage system (cars, motors, etc.).		Railway cars and locomotives.		Falls of persons.		Falling objects (rocks, timbers, etc.).		Nails, splinters, etc.		Hand tools, axes, bars, etc.		Electricity.		Machinery.		Failure of ladder, scaffold, or other support.		Handling hot materials.		Other causes.		Total.	
16	17	18	19	20	21	22	23	24	25	26	27	28	29	30			31	32	33	34	35	36	37	38	39	40	41			31	32	33	34	35	36	37	38	39	40	41															
82	6	33	37	78	159	5	7	9	126	19	193	36	394	1,184	9	7	34	67	53	80	10	31	6	22	152	471	8	1	184	83	188	67	1	19	28	12	41	1	3	3	6	22	152	471	8	1									
1	18	11	18	11	16	1	1	12	5	10	10	4	10	4	83	9	7	34	67	53	80	10	31	6	22	152	471	8	1	184	83	188	67	1	19	28	12	41	1	3	3	6	22	152	471	8	1								
92	4	3	7	22	93	1	2	2	23	3	13	1	36	3	331	5	2	5	2	2	2	1	6	1	1	1	18	2	1	331	188	67	1	19	28	12	41	1	3	3	6	22	152	471	8	1									
50	12	2	43	37	68	15	2	92	17	192	34	185	749	67	1	1	1	3	1	1	1	1	1	1	2	25	316	17	1	749	283	359	2	1	19	28	12	41	1	3	3	6	22	152	471	8	1								
19	10	1	32	21	19	1	2	22	8	41	32	75	283	2	2	19	28	12	41	1	21	2	2	2	2	101	316	2	1	283	359	75	1	1	1	1	1	1	1	1	1	1	1	1	1	1									
29	8	15	24	32	67	69	1	6	1	20	5	50	359	75	1	1	1	1	1	1	1	1	1	1	1	1	2	2	1	359	75	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1								
2	1	3	17	13	13	1	1	13	1	36	3	75	164	164	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	164	164	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2						
15	8	1	11	36	82	2	1	51	...	75	28	127	437	127	2	12	15	21	14	1	3	3	3	3	3	37	108	1	1	437	238	14	1	51	37	13	11	6	19	1	6	78	237	237	237	237	237								
19	3	20	17	9	25	1	4	1	21	39	12	62	238	14	1	51	37	13	11	6	19	1	6	78	237	237	237	237	237	238	238	14	1	51	37	13	11	6	19	1	6	78	237	237	237	237	237								
5	9	4	7	15	16	...	5	1	8	15	2	43	132	2	2	1	1	1	2	4	1	...	3	15	15	15	15	15	15	1	132	132	43	132	2	1	1	1	1	1	1	1	1	1	1	1	1	1	1						
126	22	35	28	64	103	4	18	1	28	64	11	159	677	23	6	14	37	1	5	1	3	3	3	3	2	40	135	1	1	677	23	6	14	37	1	5	1	3	3	3	2	40	135	135	135	135	135								
4	1	4	1	1	1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...					
72	2	11	55	21	2	80	6	5	90	14	279	23	235	895	4	2	5	9	2	2	2	2	2	2	2	20	44	1	1	895	235	10	8	16	25	9	16	1	8	7	48	148	148	148	148	148									
38	2	1	11	50	65	4	10	4	81	81	117	11	133	608	10	8	16	25	9	16	1	8	7	48	148	148	148	148	148	608	608	10	8	16	25	9	16	1	8	7	48	148	148	148	148	148									
37	5	2	5	20	42	2	2	17	2	26	4	2	164	2	4	1	30	69	27	34	1	7	2	4	85	264	2	1	164	164	2	4	1	30	69	27	34	1	7	2	4	85	264	264	264	264	264								
67	17	8	23	73	108	7	5	11	63	6	118	7	43	556	19	11	67	142	30	61	11	46	19	34	91	531	1	1	556	556	19	11	67	142	30	61	11	46	19	34	91	531	531	531	531	531									
...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...				
2	...	5	10	22	22	2	2	22	...	97	1	21	182	5	1	9	3	1	1	...	7	...	...	...	...	...	...	...	...	182	182	5	1	9	3	1	1	...	7	...	...	...	...	...	...	...	...	...	...	...					
1	...	7	2	...	8	1	1	2	5	1	2	1	5	36	3	1	8	42	2	2	...	...	...	...	...	...	...	...	...	36	36	3	1	8	42	2	2	...	...	...	...	...	...	...	...	...	...	...	...	...					
30	4	10	15	32	2	89	3	2	4	30	15	81	22	130	469	17	5	17	64	22	24	4	15	4	5	18	195	1	1	469	469	17	5	17	64	22	24	4	15	4	5	18	195	195	195	195	195	195	195	195	195	195	195	195	
693	113	146	375	564	73	1,107	48	76	37	736	208	1,488	242	1,839	7,745	184	47	319	585	220	345	42	213	54	121	751	2,881	1	1	7,745	184	47	319	585	220	345	42	213	54	121	751	2,881	2,881	2,881	2,881	2,881	2,881	2,881	2,881	2,881					
814	117	130	385	757	1,438	112	132	36	875	252	2,163	217	2,227	9,656	128	66	258	397	149	333	27	187	51	60	584	2,240	1	1	9,656	128	66	258	397	149	333	27	187	51	60	584	2,240	2,240	2,240	2,240	2,240	2,240	2,240	2,240	2,240	2,240	2,240	2,240			

^b Blast, reverberatory, and roasting furnaces; converters, casting department, and refineries.
^c Yards, shops, construction, etc.

14 ACCIDENTS AT METALLURGICAL WORKS IN UNITED STATES.

TABLE 5.—*Ore-dressing plants: Fatalities and injuries, by causes and States, 1913 to 1917.*

	Killed.					Injured.				
	1913	1914	1915	1916	1917	1913	1914	1915	1916	1917
Accidents by causes:										
1. Haulage system (cars, motors, etc.).....	1	.....	3	3	7	98	79	106	146	135
2. Railway cars and locomotives.....	1	3	2	4	4	34	38	17	42	29
3. Crushers, rolls, or stamps.....	.....	2	5	.....	3	64	64	129	168	112
4. Tables, jigs, etc.....	.....	.....	.....	.....	2	65	46	59	82	61
5. Other machinery.....	2	6	7	11	9	219	170	299	336	282
6. Falls of persons.....	3	3	6	2	9	238	205	249	373	399
7. Suffocation in ore bins.....	1	2	3	3	3	.....	2	3	4	6
8. Falling objects (rocks, timbers, etc.).....	3	3	.....	1	4	367	222	192	363	371
9. Cyanide or other poisoning.....	1	.....	.....	.....	.....	8	9	23	13	24
10. Scalding (steam or water).....	.....	.....	.....	2	1	24	9	12	35	18
11. Electricity.....	1	2	3	2	4	21	30	38	53	40
12. Hand tools, axes, bars, etc.....	.....	.....	.....	1	.....	199	133	235	360	249
13. Nails, splinters, etc.....	.....	.....	.....	.....	.....	74	78	131	171	193
14. Flying pieces of rock from sledging or crushing.....	.....	.....	.....	.....	.....	132	50	76	109	302
15. Other causes.....	3	2	1	4	1	434	299	526	929	731
Total.....	16	23	30	33	47	1,977	1,434	2,095	3,184	2,952
Accidents by States:										
Alabama.....	.....	.....	1	.....	1	16	1	6	9	7
Alaska.....	.....	1	.....	.....	3	.....	30	73	127	141
Arizona.....	4	5	1	3	6	335	287	350	524	578
Arkansas.....	.....	.....	.....	.....	.....	.....	.....	2	20	11
California.....	.....	1	2	.....	.....	36	111	91	118	30
Colorado.....	5	2	7	4	7	127	103	153	176	214
Georgia.....	.....	.....	.....	.....	.....	.....	.....	3	9	1
Idaho.....	1	1	1	.....	.....	30	19	55	75	62
Illinois.....	.....	.....	.....	.....	.....	34	3	3	4	9
Kansas.....	.....	.....	.....	.....	.....	.....	.....	2	7	15
Maryland.....	.....	.....	.....	.....	.....	.....	.....	.....	1	.....
Michigan.....	.....	1	.....	2	2	25	51	112	137	88
Minnesota.....	.....	.....	.....	.....	.....	.....	.....	22	48	40
Missouri.....	1	2	2	1	2	209	180	155	186	175
Montana.....	1	4	5	3	6	189	121	292	168	148
Nevada.....	.....	2	4	1	4	83	83	147	133	117
New Jersey.....	.....	.....	1	3	2	29	27	26	45	57
New Mexico.....	1	.....	2	4	1	111	95	131	310	183
New York.....	.....	.....	1	4	1	.....	12	38	73	77
North Carolina.....	.....	.....	.....	.....	.....	.....	.....	4	3	14
Oklahoma.....	.....	.....	.....	.....	2	11	35	3	15	208
Oregon.....	.....	.....	.....	.....	.....	3	5	11	2	6
Pennsylvania.....	.....	.....	.....	.....	.....	.....	.....	.....	1	1
South Dakota.....	.....	.....	.....	.....	.....	34	10	33	51	23
Tennessee.....	.....	.....	.....	1	1	13	1	27	48	40
Texas.....	.....	.....	.....	.....	.....	.....	7	.....	7	6
Utah.....	2	4	2	5	5	531	211	263	711	496
Vermont.....	.....	.....	.....	.....	.....	.....	.....	3	8	13
Virginia.....	.....	.....	1	1	.....	20	5	35	43	16
Washington.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	8
West Virginia.....	.....	.....	.....	.....	3	68	16	.....	90	150
Wisconsin.....	.....	.....	.....	.....	1	73	21	4	35	18
Other States.....	1	.....	.....	1	1	.....	.....	.....	.....	.....
Total.....	16	23	30	33	47	1,977	1,434	2,095	3,184	2,952

TABLE 6.—*Smelting plants: Fatalities and injuries, by causes and States, 1913 to 1917:*

	Killed.					Injured.				
	1913	1914	1915	1916	1917	1913	1914	1915	1916	1917
Accidents by causes:										
16. Haulage system (cars, motors, etc.).....	5	3	10	4	7	336	495	529	814	693
17. Railway cars and locomotives.....	5	7	2	2	4	75	111	61	117	113
18. Cranes.....	4	3	2	5	3	68	55	58	130	146
19. Other machinery.....	8	3	5	3	9	253	250	290	385	375
20. Falls of persons.....	10	6	3	9	8	364	620	499	757	564
21. Suffocation in ore bins.....	1	2	1	1	1	13	1	8	1	73
22. Flying or falling objects (rocks, timbers, etc.).....	3	1	1	4	2	603	1,052	914	1,438	1,107
23. Gas (burns or asphyxiation).....	3	1	3	1	1	18	59	68	112	48
24. Scalding (steam or water).....	1	1	2	1	2	45	62	46	132	76
25. Electricity.....	2	2	4	1	9	57	49	46	36	37
26. Hand tools, axes, bars, etc.....						423	588	633	875	736
27. Nails, splinters, etc.....						79	96	146	252	208
28. Burns from matte, slag, or molten metal (pouring or spilling).....	4	2	3	1	2	777	959	894	2,163	1,488
29. Hot-metal explosions.....	2	3	1	3	2	148	162	160	217	242
30. Other causes.....	3	6	1	1	4	938	1,116	1,366	2,227	1,839
Total.....	47	33	38	36	53	4,247	5,673	5,718	9,656	7,745
Accidents by States:										
Arizona.....	15	3	7	1	10	805	553	574	1,112	1,184
Arkansas.....									154	83
California.....	2	1		1	5	144	163	163	224	188
Colorado.....	1	2	6	1	1	295	636	404	508	331
Illinois.....	2	3	2	2	3	271	697	782	1,356	749
Kansas.....			1	3	1	63	89	408	695	283
Maryland.....				1	2				605	359
Michigan.....				1					251	164
Missouri.....			3	2	2	353	257	304	317	437
Montana.....	4	6	6	3		390	538	457	333	238
Nevada.....	5	1			3	128	33	58	90	132
New Jersey.....	2	3	4	6	5	200	622	630	646	677
New Mexico.....										10
New York.....	1	1		1		15	49		361	
Oklahoma.....	3	1	1	1	4	121	97	262	817	895
Oregon.....										
Pennsylvania.....		1	2	3	3	251	205	339	610	608
South Dakota.....									1	
Tennessee.....		1	1	1		372	326	249	241	
Texas.....									179	164
Utah.....	10	5	3	8	9	554	605	437	622	556
Vermont.....									2	
Virginia.....									39	
Washington.....				1					135	
West Virginia.....	1		1		1	86	61	106	148	182
Wisconsin.....									1	36
Other States.....	1	5	1		4	199	742	545	209	469
Total.....	47	33	38	36	53	4,247	5,673	5,718	9,656	7,745

16 ACCIDENTS AT METALLURGICAL WORKS IN UNITED STATES.

TABLE 7.—*Metallurgical plants: Percentage of fatalities and injuries, by causes, during the year ended Dec. 31, 1917.*

Cause of accident.	Killed			Injured.		
	Num-ber killed.	Per cent of group total.	Per cent of grand total.	Num-ber injured.	Per cent of group total.	Per cent of grand total.
Ore-dressing plants:						
1. Haulage system (cars, motors, etc.).....	7	14.89	6.03	135	4.57	0.99
2. Railway cars and locomotives.....	4	8.51	3.45	29	.98	.21
3. Crushers, rolls, or stamps.....	3	6.38	2.59	112	3.80	.83
4. Tables, jigs, etc.....	2	4.26	1.72	61	2.07	.45
5. Other machinery.....	9	19.15	7.76	282	9.55	2.08
6. Falls of persons.....	9	19.15	7.76	399	13.52	2.94
7. Suffocation in ore bins.....	3	6.38	2.59	6	.20	.05
8. Falling objects (rocks, timbers, etc.).....	4	8.51	3.45	371	12.57	2.73
9. Cyanide or other poisoning.....				24	.81	.18
10. Scalding (steam or water).....	1	2.13	.86	18	.61	.13
11. Electricity.....	4	8.51	3.45	40	1.36	.29
12. Hand tools, axes, bars, etc.....				249	8.43	1.83
13. Nails, splinters, etc.....				193	6.54	1.42
14. Flying pieces of rock from sledging or crushing.....				302	10.23	2.23
15. Other causes.....	1	2.13	.86	731	24.76	5.38
Total.....	47	100.00	40.52	2,952	100.00	21.74
Smelting plants:						
16. Haulage system (cars, motors, etc.).....	7	13.21	6.03	693	8.95	5.11
17. Railway cars and locomotives.....	4	7.55	3.45	113	1.46	.83
18. Cranes.....	3	5.66	2.59	146	1.89	1.08
19. Other machinery.....	9	16.98	7.76	375	4.84	2.76
20. Falls of persons.....	8	15.10	6.90	564	7.28	4.15
21. Suffocation in ore bins.....	1	1.89	.86	73	.94	.54
22. Flying or falling objects (rocks, timbers, etc.).....	2	3.77	1.72	1,107	14.29	8.15
23. Gas (burns or asphyxiation).....				48	.62	.35
24. Scalding (steam or water).....	2	3.77	1.72	76	.98	.56
25. Electricity.....	9	16.98	7.76	37	.48	.27
26. Hand tools, axes, bars, etc.....				736	9.50	5.42
27. Nails, splinters, etc.....				208	2.69	1.53
28. Burns from matte, slag, or molten metal (pouring or spilling).....	2	3.77	1.72	1,488	19.21	10.96
29. Hot-metal explosions.....	2	3.77	1.72	242	3.12	1.78
30. Other causes.....	4	7.55	3.45	1,839	23.75	13.54
Total.....	53	100.00	45.69	7,745	100.00	57.04
Auxiliary works:						
31. Haulage system (cars, motors, etc.).....	1	6.25	.86	184	6.39	1.35
32. Railway cars and locomotives.....	2	12.50	1.72	47	1.63	.35
33. Falls of persons.....	8	50.00	6.90	319	11.07	2.35
34. Falling objects (rocks, timbers, etc.).....	2	12.50	1.72	585	20.30	4.31
35. Nails, splinters, etc.....	1	6.25	.86	220	7.64	1.62
36. Hand tools, axes, bars, etc.....				345	11.98	2.54
37. Electricity.....				42	1.46	.31
38. Machinery.....				213	7.39	1.57
39. Failure of ladder, scaffold, or other support.....	1	6.25	.86	54	1.87	.40
40. Handling hot materials.....				121	4.20	.89
41. Other causes.....	1	6.25	.86	751	26.07	5.53
Total.....	16	100.00	13.79	2,881	100.00	21.22
Grand total.....	116	100.00	100.00	13,578	100.00	100.00

TABLE 8.—*Metallurgical plants: Men employed and the equivalent in 300-day workers, by States, 1913 to 1917.*

State.	Actual number employed.						Equivalent in 300-day workers (calculated).					
	Ore-dressing plants.			Smelting plants.			Ore-dressing plants.			Smelting plants.		
	1913	1914	1915	1916	1917	1918	1913	1914	1915	1916	1917	1918
Alabama.....	130	100	57	92	133	133	104	58	19	55	149	149
Alaska.....	.....	225	520	925	487	.....	.....	253	530	1,111	487	.....
Arizona.....	1,321	1,314	1,776	2,380	2,630	2,630	1,529	1,457	1,839	2,637	2,630	5,663
Arkansas.....	.....	(a)	89	173	163	.....	.....	.....	75	132	123	5,609
California.....	688	581	766	794	755	755	645	512	812	780	908	708
Colorado.....	785	960	1,219	1,382	2,327	2,327	867	975	1,219	1,382	1,715	2,884
Georgia.....	(a)	(a)	57	68	82	82	.....	.....	48	65	83	.....
Idaho.....	372	441	470	611	642	642	350	388	438	629	597	.....
Illinois.....	178	164	(a)	58	156	156	1,946	3,228	3,467	36	143	4,398
Kansas.....	(a)	(a)	114	80	206	206	.....	121	85	79	107	4,083
Maryland.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	3,728
Michigan.....	756	1,761	2,354	2,255	2,426	2,426	507	1,646	2,406	2,346	2,510	1,238
Minnesota.....	(a)	(a)	241	286	337	337	161	161	161	239	268	.....
Missouri.....	1,657	1,466	1,462	1,375	1,523	1,523	1,630	1,339	1,316	1,332	1,307	1,898
Montana.....	2,527	1,709	2,451	2,153	2,061	2,061	3,011	1,725	2,635	2,152	2,019	3,265
Nevada.....	1,444	1,396	1,401	1,556	1,565	1,565	1,597	1,525	1,541	1,713	1,621	1,018
New Jersey.....	383	440	562	715	537	537	385	451	607	804	551	5,123
New Mexico.....	694	741	762	1,346	891	891	842	786	878	1,547	969	5,76
New York.....	145	145	370	565	565	565	104	104	348	509	522	514
North Carolina.....	(a)	(a)	94	55	46	46	.....	.....	61	51	38	.....
Oklahoma.....	254	404	113	94	452	452	279	394	88	71	346	6,093
Oregon.....	40	142	69	77	97	97	37	113	56	40	79	4,442
Pennsylvania.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
South Dakota.....	360	358	395	362	250	250	392	431	461	387	292	234
Tennessee.....	218	87	328	460	425	425	173	90	284	401	382	1,118
Texas.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	1,172
Utah.....	2,320	2,054	1,664	3,017	4,103	4,103	2,804	2,398	2,005	3,679	4,865	2,928
Vermont.....	.....	.....	131	137	215	215	.....	.....	.....	123	194	2
Virginia.....	174	100	488	475	709	709	163	81	511	453	690	290
Washington.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	1,171
West Virginia.....	197	175	234	421	247	247	179	132	268	376	213	1,269
Wisconsin.....	398	290	357	340	450	450	315	172	283	311	339	1,130
Other States.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	5
Total.....	14,985	15,128	18,564	22,365	24,111	24,111	16,154	15,225	19,107	23,470	24,372	50,659

a Included in "Other States."

TABLE 9.—*Metallurgical plants: Days of labor performed and average number of days plants were operated, by States, 1913 to 1917.*

State.	Days of labor performed.										Average days active.										
	Ore-dressing plants.					Smelting plants.					Ore-dressing plants.					Smelting plants.					
	1913	1914	1915	1916	1917	1913	1914	1915	1916	1917	1913	1914	1915	1916	1917	1913	1914	1915	1916	1917	
Alabama.....	31,250	17,250	5,572	16,488	44,715						240	173	98	179	232						
Alaska.....		76,046	159,078	333,300	135,960							338	306	300	300						
Arizona.....	458,681	437,061	557,719	790,820	803,967	1,064,714	875,543	910,120	1,210,377	1,520,283		333	311	332	307						
Arkansas.....			22,408	43,730	36,840					182,575		252	287	235	235						
California.....	193,403	153,471	243,708	234,094	271,800	351,610	314,162	371,847	382,190	412,400	290	264	318	285	360	322	343	354	184	344	
Colorado.....	230,052	202,491	265,678	414,681	514,960	989,335	1,006,670	839,587	929,539	899,200	331	305	300	300	300	362	358	361	300	300	
Georgia.....		14,540	14,540	188,673	54,669							255	255	286	302						
Idaho.....		116,527	131,352	188,673	179,238						252	264	279	309	279	358	362	340	344	354	
Illinois.....	105,023	36,325	25,584	10,742	43,008	697,120	1,167,544	1,247,660	1,630,241	1,319,525	252	221		188	276	356	359	285	339	290	
Kansas.....	44,794			23,853	32,130	268,870	337,890	736,108	1,221,975	623,042			224	298	156	336	359	285	351	327	
Maryland.....			721,634	705,788	762,874					1,117,802		280	307	312	310				310	326	310
Michigan.....	152,121	493,875		71,963	86,703					371,479	201	280	307	312	310				310	326	310
Minnesota.....			394,850	399,704	392,228	392,467	353,126	400,689	541,880	569,400	295	274	270	291	258	358	360	347	354	365	
Missouri.....	489,091	401,615	795,575	795,575	465,705	446,645	792,731	1,200,496	979,580	782,157	358	303	325	300	295	365	348	339	306	314	
Montana.....	903,414	517,458			446,446	303,846	235,006	259,972	365,372	413,423	353	328	330	330	311	362	348	330	351	362	
Nevada.....	509,108	457,581		514,024	165,258	275,238	1,214,362	1,487,346	1,778,862	1,536,773	301	308	324	337	308	364	340	361	365	356	
New Jersey.....	115,420	135,312	182,230	241,165	290,846				16,464	22,680	364	318	346	345	326	343	341	343	343	149	
New Mexico.....	232,772	205,843	263,446	464,224	290,846																
New York.....		31,151	104,382	152,632	195,661	35,500	64,500		154,200	277,777	215	282	269	277	323	307					
North Carolina.....			18,235	13,800	11,268																
Oklahoma.....	63,795	118,217	26,397	21,283	103,653	431,065	424,145	612,835	1,646,034	1,827,894	330	293	234	226	230	365	351	365	318	361	
Oregon.....	11,033	33,960	16,879	1,969	25,627				7,568	7,568	276	239	245	155	244				344		
Pennsylvania.....				1,800	57,663	549,640	452,803	661,376	931,710	1,332,500	326	361	350	320	350	350	354	328	361	360	
South Dakota.....	117,458	129,410	138,182	115,978	174,513				70,200		326	312	241	262	269	358	352	351	147		
Tennessee.....	51,822	27,131	79,091	129,370	157,475	164,700	105,229	335,435	371,495	400,962	293	324	280	293	293	365	365	365	365	365	
Texas.....	18,964	18,465		129,370	29,320				878,424	982,918	361	350	361	361	366	365	365	365	365	359	
Utah.....	841,164	719,243	601,358	1,072,745	1,459,359	587,285	1,013,065	802,270	86,400				281	307	271				50		
Vermont.....			36,822	12,674	206,821				86,900		333	243	314	286	292				346		
Virginia.....	57,874	24,330	153,397	136,038	11,800				351,275		34	196		239	187				355	336	
Washington.....				4,039		329,005	294,015	315,725	337,024	380,578											
West Virginia.....			80,296	112,854	64,011				304,368		226	216	298	274	259	356	365	364	349		
Wisconsin.....	94,461	51,623	87,994	93,211	107,699	405,076	1,031,948	168,403	129,950	704,537	237	178	247	274	239	314	332	327	361	346	
Other States.....																					
Total.....	4,846,338	4,567,529	5,732,184	7,041,083	7,314,997	292,766	9,700,769	10,878,486	14,809,046	15,197,643	323	302	309	315	303	355	348	347	338	342	

Metallurgical plants.

TABLE 10.—*Injuries and number injured per 1,000 300-day workers employed, by causes, 1913 to 1917.*

Cause of accident.	Number injured.					Number injured per 1,000 300-day workers.				
	1913	1914	1915	1916	1917	1913	1914	1915	1916	1917
Ore-dressing plants:										
1. Haulage system (cars, motors, etc.).....	98	79	106	146	135	6.07	5.19	5.55	6.22	5.54
2. Railway cars and locomotives.....	34	38	17	42	29	2.10	2.50	.89	1.79	1.19
3. Crushers, rolls, or stamps	64	64	129	168	112	3.96	4.20	6.75	7.16	4.60
4. Tables, jigs, etc.....	65	46	59	82	61	4.02	3.02	3.09	3.49	2.50
5. Other machinery.....	219	170	299	336	282	13.56	11.17	15.65	14.32	11.57
6. Falls of persons.....	238	205	249	373	399	14.73	13.47	13.03	15.89	16.37
7. Suffocation in ore bins.....		2	3	4	6		.13	.16	.17	.25
8. Falling objects (rocks, timbers, etc.).....	367	222	192	363	371	22.72	14.58	10.05	15.47	15.22
9. Cyanide or other poisoning.....	8	9	23	13	24	.49	.59	1.20	.55	.98
10. Scalding (steam or water).....	24	9	12	35	18	1.49	.59	.63	1.49	.74
11. Electricity.....	21	30	38	53	40	1.30	1.97	1.99	2.26	1.64
12. Hand tools, axes, bars, etc.	199	133	235	360	249	12.32	8.74	12.30	15.34	10.22
13. Nails, splinters, etc.....	74	78	131	171	193	4.58	5.12	6.85	7.29	7.92
14. Flying pieces of rock from sledging or crushing.....	132	50	76	109	302	8.17	3.28	3.98	4.64	12.39
15. Other causes.....	434	299	526	929	731	26.87	19.64	27.53	39.58	29.99
Total	1,977	1,434	2,095	3,184	2,952	122.38	94.19	109.65	135.66	121.12
Number of 300-day workers.	16,154	15,225	19,107	23,470	24,372					
Smelting plants:										
16. Haulage system (cars, motors, etc.).....	386	495	529	814	693	15.88	15.31	14.59	16.49	13.68
17. Railway cars and locomotives.....	75	111	61	117	113	3.09	3.43	1.68	2.37	2.23
18. Cranes.....	68	55	58	130	146	2.80	1.70	1.60	2.63	2.88
19. Other machinery.....	253	250	290	385	375	10.41	7.73	8.00	7.80	7.40
20. Falls of persons.....	364	620	499	757	564	14.97	19.17	13.76	15.34	11.13
21. Suffocation in ore bins.....	13	1	8	1	73	.53	.03	.22	.02	1.44
22. Flying or falling objects (rocks, timbers, etc.).....	603	1,052	914	1,438	1,107	24.81	32.53	25.21	29.13	21.85
23. Gas (burns or asphyxiation).....	18	59	68	112	48	.74	1.83	1.87	2.27	.95
24. Scalding (steam or water).....	45	62	46	132	76	1.85	1.92	1.27	2.67	1.50
25. Electricity.....	57	49	46	36	37	2.34	1.52	1.27	.73	.73
26. Hand tools, axes, bars, etc.....	423	586	633	875	736	17.40	18.12	17.46	17.73	14.53
27. Nails, splinters, etc.....	79	96	146	232	208	3.25	2.97	4.03	5.10	4.11
28. Burns from molten metal (pouring or spilling).....	777	959	895	2,163	1,488	31.96	29.66	24.65	43.82	29.37
29. Hot-metal explosions.....	148	162	180	217	242	6.09	5.01	4.41	4.40	4.78
30. Other causes.....	938	1,116	1,366	2,227	1,839	38.59	34.51	37.67	45.11	36.30
Total	4,247	5,673	5,718	9,656	7,745	174.71	175.44	157.69	195.61	152.88
Number of 300-day workers.	24,309	32,336	36,262	49,363	50,659					

ACCIDENTS AT COPPER METALLURGICAL PLANTS.

As the mills and smelters treating copper ores represent such an important part of the metallurgical industry of the United States, as well as a branch that is readily segregated, Tables 11 and 12 following have been compiled from the reports of a number of selected companies whose records appear reasonably complete, and at whose plants efforts are being exerted to maintain safety organizations. These

20 ACCIDENTS AT METALLURGICAL WORKS IN UNITED STATES.

figures represent 20 ore-dressing plants and 17 smelters in various parts of the country, employing 10,059 men at mills and 13,099 at smelters in 1917; as compared with 17 mills and 19 smelters employing, respectively, 8,388 and 8,719 men in 1916. The figures are for approximately the same companies for each year, and it is believed are fairly representative of the industry. Similar figures were published by the bureau for the year 1915 in Technical Paper 164, Bureau of Mines, "Accidents at metallurgical works in the United States during the calendar year 1915."

TABLE 11.—*Summary of labor and accidents at copper metallurgical plants, 1916 and 1917.*

	1916		1917	
	Mills.	Smelters.	Mills.	Smelters.
Number of plants.....	17	19	20	17
Men employed.....	8,388	8,719	10,059	13,099
Number of 300-day workers.....	9,422	9,826	11,145	14,530
Total days' labor (shifts).....	2,826,710	2,947,719	3,343,377	4,359,002
Average days active.....	337	338	332	333
Number killed.....	10	8	10	19
Number injured.....	1,493	2,187	1,232	2,154
Number killed per 1,000, 300-day workers.....	1.06	.81	.90	1.31
Number injured per 1,000, 300-day workers.....	158.46	222.57	110.54	148.25

TABLE 12.—*Accidents by causes, at copper metallurgical plants, 1916 and 1917.*

Cause of accident.	1916				1917			
	Mills.		Smelters.		Mills.		Smelters.	
	Killed.	Injured.	Killed.	Injured.	Killed.	Injured.	Killed.	Injured.
Haulage system (cars, motors, etc.)..	1	43	1	125	1	57	4	166
Railway cars and locomotives.....	1	11		47		10	2	59
Crushers, rolls, or stamps.....		25				27		
Tables, jigs, etc.....		39				18		
Cranes.....				68			1	85
Other machinery.....	2	132		76	4	101	3	79
Falls of persons.....	1	158	2	189		184	2	177
Suffocation in ore bins.....	1	2			1	1		68
Falling objects (rocks, timbers, etc.)..		221	2	341	3	194		272
Cyanide or other poisoning.....		4				10		
Gas (burns or asphyxiation).....				6				13
Scalding (steam or water).....		11		20		6	1	29
Electricity.....		37	1	15	1	17	3	8
Hand tools, axes, bars, etc.....		193		188		116		169
Nails, splinters, etc.....		98		28		95		29
Flying pieces of rock from sledging or crushing.....		20				20		
Burns from matte, slag, or molten metal.....				453			1	309
Hot-metal explosions.....			2	48			2	45
Other causes.....	4	499		583		376		646
Total.....	10	1,493	8	2,187	10	1,232	19	2,154

TABLE 13.—Fatality rates in different branches of mineral industries in 1917 compared on a 300-day basis.

[Length of shift not considered.]

Branch of mineral industry.	Average days active.	Men employed.		Days of labor performed.	Killed.	Number killed per 1,000 employed.	
		Actual number.	Equivalent in 300-day workers (calculated).			On actual time basis.	On 300-day basis.
Metal mines.....	287	200,579	192,085	57,625,811	852	4.25	4.44
Metallurgical works:							
Ore-dressing plants.....	303	24,111	24,372	7,311,499	47	1.95	1.93
Smelters a.....	342	44,376	50,659	15,197,643	53	1.19	1.05
Auxiliary works.....	328	15,555	17,014	5,104,146	16	1.03	.94
Coal mines.....	251	757,317	634,666	190,399,680	2,696	3.56	4.25
Coke ovens:							
Beehive.....	308	18,820	19,295	5,788,576	25	1.33	1.30
By-product.....	300	13,597	16,300	4,889,853	51	3.75	3.13
Quarries (inside).....	249	54,804	45,449	13,634,773	91	1.66	2.00
Quarries (outside).....	285	27,486	26,076	7,822,584	40	1.46	1.53
Total, 1917.....	266	1,156,645	1,025,916	307,774,565	3,871	3.35	3.77
Total, 1916.....	255	1,128,257	957,393	287,218,232	3,224	2.86	3.37

a Does not include iron and steel industry.

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